resources, has modified the broad outlines of the *Challenger* results. It is of fundamental importance to the history of oceanography that the record of these early investigations should be made accessible once for all by the best authorities; those authorities, to wit, to whom the researches themselves were originally due. This has, of course, been done in great measure in the published narrative and reports of the *Challenger* Expedition; but, as in all other undertakings of the same order of magnitude, there is a sort of aftermath of result, the fruit of incidental inquiries into special methods or of special subsequent opportunities arising from the original main enterprise. These collateral results are necessary to complete the historic picture, both of the work and of the men who carried it out.

It is, therefore, a matter for much satisfaction that this has now been done, in so far as the physical and chemical work is concerned, by the chemist and physicist of the expedition himself. Mr. Buchanan entered upon his work with nearly everything to plan and invent, both as regards what was to be done and how it was to be done, and he has continued and expanded it in many directions since, along lines similar in many ways to those followed on the *Challenger*. We welcome this volume of reprints of his original papers, both for historical reasons and for the permanent value of the results obtained.

Of the fifteen papers reprinted in this book, two deal with the distribution of temperature under ice in Linlithgow Loch, describing observations showing the fallacy of the belief that the temperature of the water of a frozen lake is always that of the point of maximum density. With these exceptions, they are all concerned with oceanographical matters; either describing methods and results of experiment, as in the papers on absorption of carbonic acid by saline solutions, on the composition of sea-water ice, on determinations of specific gravity, or on apparatus for deep-sea investigation generally; or else giving the results of observations in special regions of the ocean. The lectures on "Laboratory Experiences on Board the *Challenger*," and "Deep-sea Investigation and the Apparatus Employed in it," are of special historical value, as they describe in full detail the instruments and methods employed in deep-sea work from the time of Columbus up to and including the *Challenger* expedition itself.

Mr. Buchanan's work after the *Challenger* expedition was largely carried on in the cable ships of the Silvertown Company, which afforded him special opportunities for research in connection with lines of soundings on the west coast of Africa. The results are embodied in important papers on the "Dacia" shoal, on the land slopes separating continents and oceans, and on the exploration of the Gulf of Guinea. The remarkable submarine valleys running out from the mouths of the Congo and other West African rivers are described.

OUR BOOKSHELF.

Cabinet Timbers of Australia. By R. T. Baker. Pp. 186+lxviii plates. (Sydney: Technological Museum, 1913.)

THIS work directs attention to a section of Australian timbers which is especially suitable for cabinet work, furniture, and interior decoration.

More than sixty species, belonging to twenty-one different natural orders, are described and illustrated, the natural colour and graining of each wood being depicted by the aid of colour photography. There are also excellent illustrations in black and white of furniture and interior fittings made from several of the woods.

The coloured illustrations are the feature of the book. At first sight many of them give one the impression of being thin veneers, an impression only removed by fingering the surface of the picture. The very texture of the wood is so well brought out by this process that its working qualities can almost be predicted. We have placed actual specimens alongside the prints in several cases, and the majority of them match very closely. The text is not equal to the illustrations. Each plate is accompanied by a popular description of the timber and the uses to which it can be applied but the information given is very meagre. This is followed by a condensed description of the tree in technical language which will only be understood by the trained botanist. The geographical range of each tree is given, but little is said about the supply available, which is one of the most important points for the trade.

The main object of the author, however, is to interest Australians themselves in their native timbers and bring home to them the necessity for taking steps to prevent these valuable timber trees being exterminated in the process of clearing the land for settlement. The book certainly brings out the fact that Australia possesses a rich assortment of beautiful cabinet woods exhibiting a wide variation in figure, texture, and colour, and the Empire, no less than the Commonwealth, will suffer an irreparable loss if steps are not taken to stop the present waste of this valuable heritage of natural wealth.

Marsh's Mathematics Work-book. Designed by H. W. Marsh. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1913.) Price 3*s*. net.

THIS book consists of about 250 blank unruled sheets of writing-paper of good quality, divided into two sections. Each section is fastened to the book-cover by two strong paper fasteners, so that the sheets may be removed as required. The cover is of substantial quality, having leather

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corners and back. Several daily record sheets are provided, and the student is expected to fill these up, giving particulars of date, portion of the text-book or work studied, remarks, as well as particulars of the time which he has spent at other subjects. The student is expected to certify this record by his signature. Pasted to the interior of the cover are elaborate instructions regarding methods of entering work done, for filling up the record sheet, excuses, collection and distribution of work-books, inspection, and corrected work. Some of these instructions are distinctly good, and might be taken to heart by many teachers of mathematics in this country For example—"as soon as possible learn to draw a light, smooth, draughtsman's line." Those who have had the opportunity of examining the British average mathematical home-work will appreciate this quotation. No doubt the designer of this book has found that it meets perfectly the needs of his own institution and students, but we question whether it will meet with much favour in this country, where it is well known that every teacher prefers to develop his own methods as regards style of home-work, examination, and so on.

The Celebration of the Two Hundred and Fiftieth Anniversary of the Royal Society of London, July 15–19, 1912. Pp. 128. (London: Humphrey Milford, 1913.) Price 5*s*. net.

The interesting events in connection with the celebration of the 250th anniversary of the Royal Society in July, 1912, were reported in these columns at the time, and the contents of this volume consequently cover ground familiar to our readers. This permanent record of the proceedings contains a full list of delegates and verbatim accounts of the addresses, speeches, telegrams, and letters addressed to the Society from learned societies and other bodies throughout the world. With the new edition of the "Record" of the Society, and the facsimile reproduction of the pages of signatures of the fellows in the Charter book, from that of the Royal founder down to those entered in the summer of 1912, it will form an appropriate and lasting memorial of a noteworthy celebration.

Who's Who in Science: International, 1914. Edited by H. H. Stephenson. Pp. xx+662. (London: J. and A. Churchill.) Price 2*s*. net.

This excellent work of reference contains, in addition to its 9000 biographies of men of science of all nationalities, other useful information. Especially convenient are the tabular statements, arranged alphabetically, of particulars about the universities of the world, which include the names in each case of the head of the university and the senior occupants of the various scientific chairs. A valuable list of the "World's Societies" is also included, and from it the name, address, number of members, the name of the secretary, and other facts can be seen at a glance. An exhaustive classified index adds greatly to the value of the volume.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of Nature. *No notice is taken of anonymous communications.]*

The Pressure of Radiation and Carnot's Principle.

I gather from a letter on this subject which appears in your last issue that Lord Rayleigh endorses the opinion that the partial pressure p of any particular frequency in full radiation may properly be deduced from the intrinsic energy-density E/v of the same frequency by Carnot's principle.

The other point to which I wished to direct attention is that, in the case of a steady stream of radiation of constant frequency, the heat quantity measured is the total heat of formation per unit volume, $E/v+p$, and not the intrinsic energy-density E/v as commonly assumed. The disagreement with experiment of Wien's well-known formula for the partition of energy in full radiation, is readily explained if we assume that it represents only the intrinsic energy. The corresponding value of the pressure is very easily deduced by reference to Carnot's principle, as Lord Rayleigh has indicated. The formula which I have proposed (*Phil Mag.*, October, 1913) is simply the sum of the pressure and energy-density thus obtained, and gives very satisfactory agreement with experiment, both for radiation and specific heat. I prefer it to Planck's formula (among other reasons) on the ground that the latter cannot be reconciled with the classical thermodynamics, and involves the conception of a *quantum*, or indivisible unit of action, which is unthinkable. The corresponding physical magnitude on my theory, which I have elsewhere called a molecule of caloric, is not necessarily indivisible, but bears a very simple relation to the intrinsic energy of an atom, which is all that is required to explain the fact that radiation may in special cases be emitted in atomic units which are multiples of a particular magnitude.

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Atomic Models and X-Ray Spectra.

In his letter to Nature of January 1 on "Atomic Models and X-Ray Spectra," Dr. F. A. Lindemann deals with the approximate agreement between the recent experiments of Mr. H. G. J. Moseley on "The High-frequency Spectra of the Elements" (*Phil. Mag.*, December, 1913), and the calculations given in my paper, "On the Constitution of Atoms and Molecules" (*Phil. Mag.*, July, September, November, 1913).

In Dr. Lindemann's opinion a theoretical explanation of Mr. Moseley's results can be obtained in several ways; and he therefore concludes that the agreement in question cannot be considered to support the assumptions used in my paper. By the help of a consideration of dimensions he seeks a relation between the five quantities, ν, r, Ne^2, m, and h. He shows that an infinite number of different expressions can be obtained for ν in terms of r, Ne^2, m, and h; and he indicates how several of these expressions may be brought in approximate agreement with the experimental results.

This procedure does not appear to me to be justified. Just as little as the five quantities ν, r, Ne^2, m, and h, the four quantities, r, Ne^2, m, and h, may be considered as independent of each other. By a consideration of dimensions we can obtain a relation

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